THE 6C** SAMPLE AND THE HIGHEST REDSHIFT RADIO GALAXIES

M. J. CRUZ, M. J. JARVIS, K. M. BLUNDELL AND S. RAWLINGS

Oxford University Astrophysics, Denys Wilkinson Building, Keble Road, Oxford, OX1 3RH, United Kingdom

We present a new radio sample, 6C** designed to find radio galaxies at $z > 4$ and discuss some of its near-infrared imaging follow-up results.

Why search for the highest redshift radio galaxies? Radio galaxies trace the most massive galaxies[1] ($> 2L_*$) and are associated with the most massive black holes[2] ($\approx 10^9\,M_\odot$) in the universe at every epoch. Recent studies support the idea that at $2 < z < 4$ they reside in proto-clusters and are progenitors of the central brightest cluster galaxies[3]. The highest redshift radio galaxies ($z > 4$) are therefore key targets for studies of formation and evolution of massive structures in the early universe. They are particularly useful in this respect as they are selected on the basis of their radio emission and thus free of problems associated with optical selection methods such as dust obscuration. Also, they tend not to have their optical and infrared emission dominated by non-stellar nuclear emission as is the case for quasars.

The 6C Filtered Sample** This is a new sample of radio galaxies drawn from the 151 MHz, 6C survey which has been filtered with radio criteria chosen to optimize the chances of finding radio galaxies at $z > 4$. It has been selected to be brighter than 0.5 Jy at 151 MHz on an area of sky of 0.33 sr and to exclude sources whose radio spectral index between 151 MHz and 1.4 GHz are flatter than 1 or whose radio angular size are larger than 12 arcsec. These are characteristics invariably seen in very distant radio galaxies[4,5,6]. The selection criteria resulted in the 6C** sample comprising 69 objects; their location within the survey region is shown in Fig. 1 (left). Based on the work of Ref. 7 we expect to have at least two sources at $z > 5$ among them.

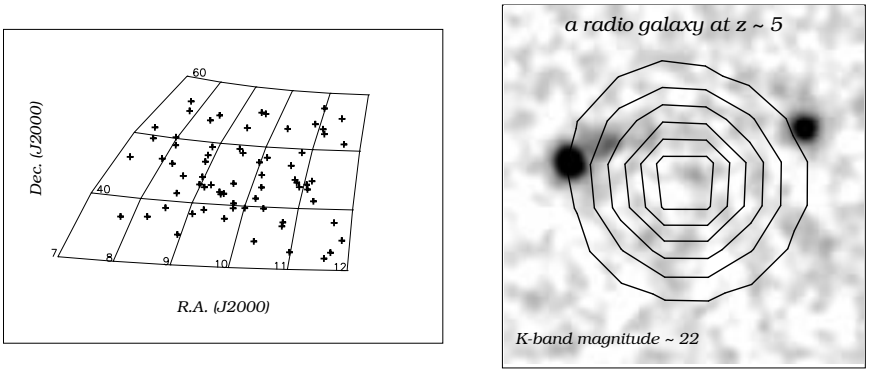

Figure 1. **Left** Location of all 6C** sources within the survey region. **Right** The 1.4 GHz radio contours overlaid onto a NIRI (Gemini) K-band image of a candidate $z > 5$, 6C** radio galaxy. The image has a size of $14''$ x $18''$.

Results and Discussion Deep K-band imaging follow-up with UFTI on UKIRT and NIRI on Gemini has provided us with near-infrared identifications for every member in our sample. K-band photometry provides an accurate method of redshift estimation by using the tightness of the $K - z$ diagram[8]. We estimate that ~ 40 % of the sources on 6C** have redshifts > 2, in accordance with extrapolations from previous studies[9]. By selecting the faintest ($K \sim 21$) members on our sample we have identified five strong candidate $z > 5$ radio galaxies. One of them was not securely detected despite a 45 min. integration with NIRI, although there are hints of an object with $K \sim 22$ close to the limit of the observation (Fig. 1, right). Future spectroscopic observations will tell us about the nature of these sources and will secure their redshifts.

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